

1979 MANUFACTURE


TR# 533

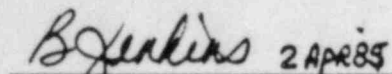
TEST REPORT
DYNAMIC CRUSH TESTING FOR
ILLINOIS POWER CO.

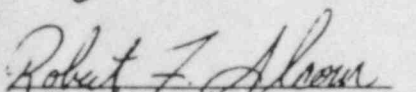
BY: Rao Akkinapalli
DATE: March 27, 1985

Reference:

Illinois Power Co.
P.O.# X-17940
Clinton Power Station


Contracts 3-24-85


Quality Assurance 2 APR 85


Engineering 3-29-85

CONTROLLED COPY NO. _____

8506110480 850606
PDR GA999 EMVHEXC
99900893 PDR

TEST REPORT

1. PURPOSE:

The purpose of this report is to furnish Illinois Power Co. with the results of Dynamic Crush tests performed per Illinois Power Co P.O. # X-17940 and Hexcel TR# 443. Rev. D.

2. TEST PROGRAM:

All the Dynamic Crush testing was performed at Hexcel/MCI using the equipment and procedures described in TR# 343, Rev. D paragraphs 3 & 4 respectively. The average Dynamic Crush strength was evaluated per para 5.0 of TR# 343, Rev. D. The results are used to study the crush strength variability of Hexcel/Solarib energy absorbing material supplied for clinton nuclear station. The specimens were obtained from production parts supplied by MCI for clinton nuclear station. Table 1 lists the specimen I.D.'s, their source and average dynamic crush strength values from production and program tests.

3. TEST DATA:

The following data for all the specimens tested is included in this report:

- A. Specimen Dimensions before testing.
- B. Specimen height after test.
- C. Specimen temperature during the test.
- D. Impact velocity
- E. Impact weight
- F. Force vs. deflection and energy vs deflection plots.
- G. Tup calibration results.

4. ATTACHMENTS:

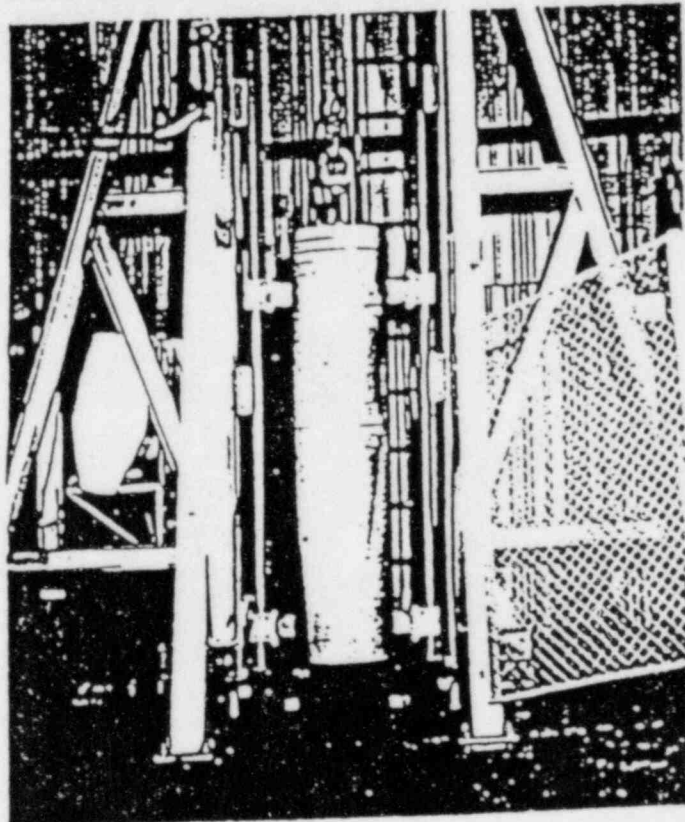
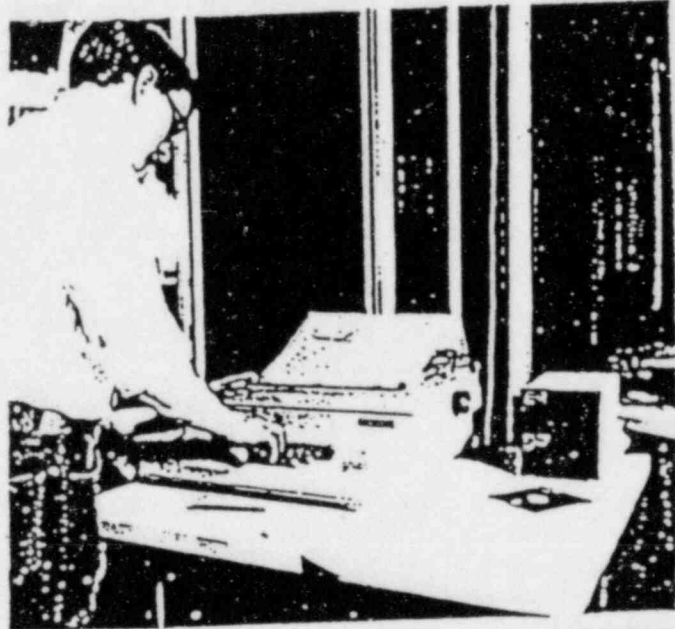
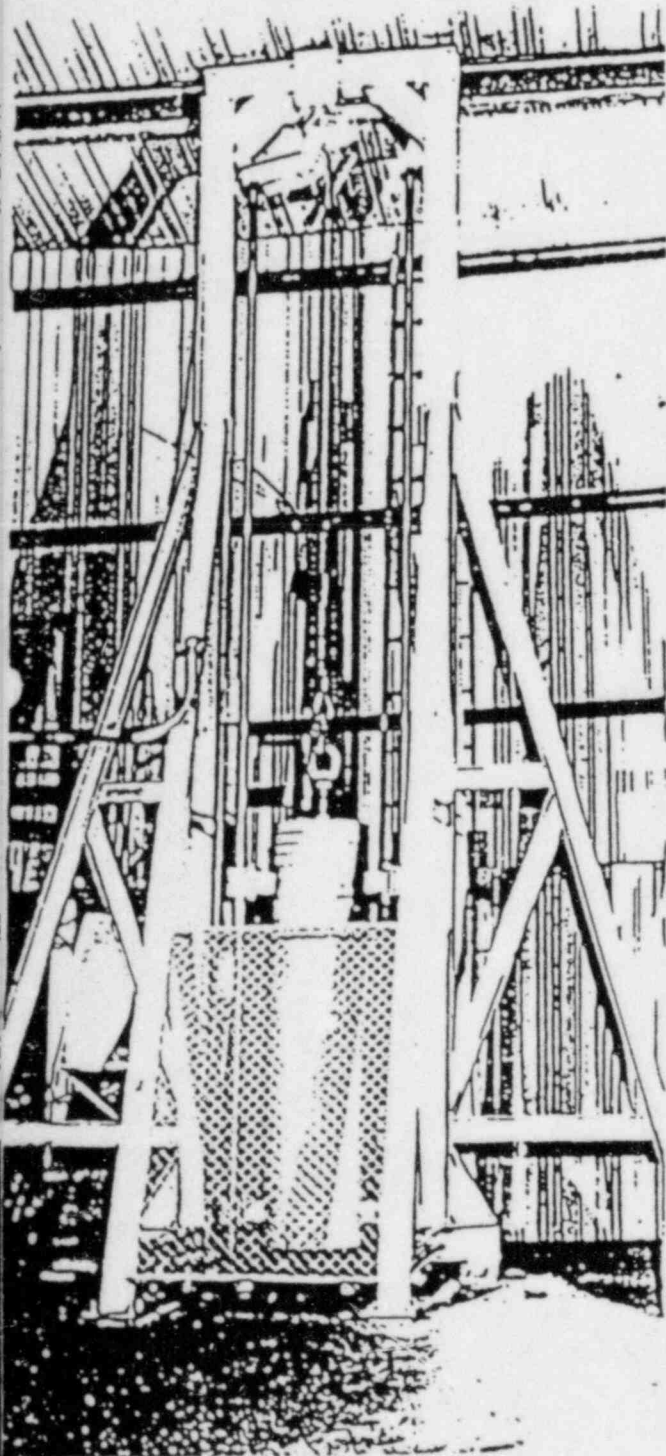
Following documents attached herewith are a part of this test report:

- A. Test set-up photograph and schematics.
- B. Calibration report.
- C. Test plots for all specimens tested.

TABLE 1

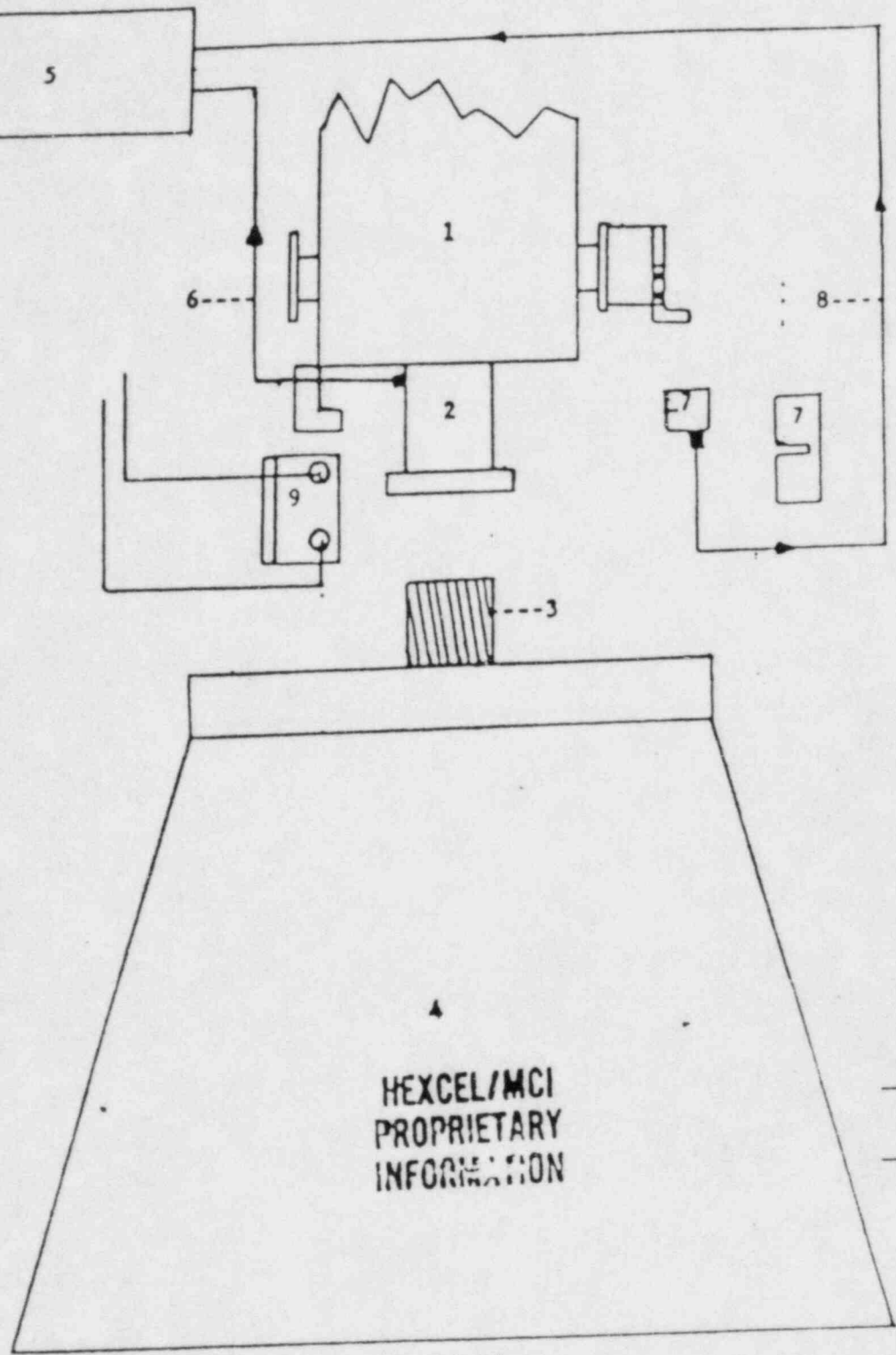
SOURCE OF SPECIMEN		PRODUCTION LIST ADCS (PSI)	PROGRAM TEST ADCS (PSI)
PWR NO.	CORE BLOCK NO.		
		5432	6430
FW-R12	SK-510	5432	6080
FW-R27	SK-510	5859	6380
HP-R1	SK-511	5920	5770
MS-R7	SK-512	5920	6080
MS-R21	SK-512	5920	6110
FW-R14	SK-512	5920	5940
FW-R29	SK-512	5671	5610
FW-R28	SK-514		

HEXCEL/MCI
PROPRIETARY
INFORMATION



COMPUTERIZED CRUSH TESTING FACILITY used to compile average dynamic crush strength properties of HEXCEL/SOLARIS stainless steel core specimens.

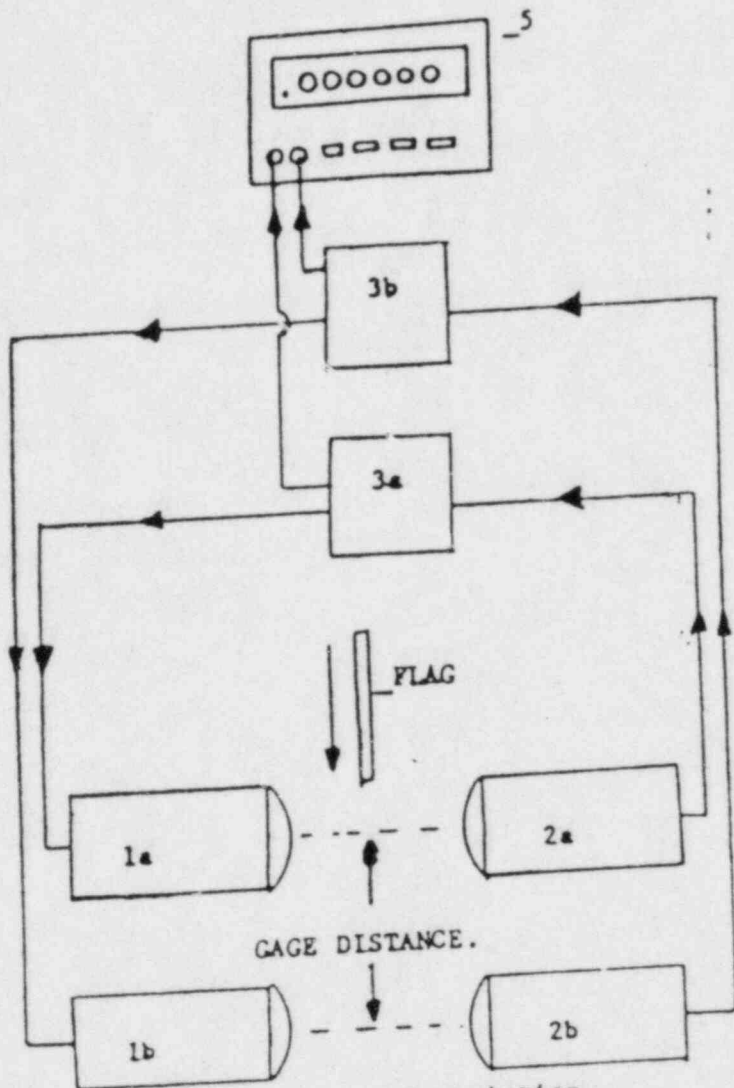
LTR	REVISION	DATE	APPR
		10/9/74	D.C.



Item No.	Description
1-----	Drop Weight.
2-----	Tup (Load Cell)
3-----	Specimen
4-----	Reaction Mass (44,000 Lbs.)
5-----	Computer System.
6-----	Input Wire.
7-----	Detector. (Trigger)
8-----	Detector Wire.
9-----	Velocity Measurement Apparatus (Complete schematic attached.)

TOLERANCES UNLESS OTHERWISE SPECIFIED ANGULAR $X \pm .1$ \pm $XX \pm .02$ $XXX \pm .005$		CONTRACT NO. 		TITLE CRUSH TEST SET UP SCHEMATICS.	
MATERIAL		DRN <i>[Signature]</i>		CHK <i>[Signature]</i>	
		APPR <i>[Signature]</i>		HEXCEL 8100 E. SLAUSON AVE. MONTEBELLO, CA 90640	

VELOCITY MEASUREMENT APPARATUS



- | Item No. | Description. |
|-------------|---|
| 1a, 1b----- | Opcon, Inc Model 1160A-100
Infrared Light Source. |
| 2a, 2b----- | Opcon, Inc Model 1261B-100
Photo Detector. |
| 3a, 3b----- | Opcon, Inc Model 8160B 1X1
Power Supply/Output Module. |
| 5----- | Hewlett-Packard Model 53114A
Universal Counter. |

**HEXCEL/MCI
PROPRIETARY
INFORMATION**

LTR	REVISION	DATE	APPR
		10/1/74	D.C.

TOLERANCES UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		HEXCEL 8100 E. SLAUSON AVE. MONTEBELLO, CA 90640
ANGULAR	$X \pm = .1$	DRN	<i>A. V. L.</i>	
	$XX \pm = .02$	CHK		
	$XXX \pm = .005$	APPR	<i>[Signature]</i>	
MATERIAL		TITLE		
		VELOCITY MEASUREMENT APPARATUS SCHEMATICS.		
		FIG. 3		

INSTRUMENTED TUP CALIBRATION

TUP IDENTIFICATION 8428 CUSTOMER: Hexcel
SERIAL NO. 7238 JOB. NO. 67538
DATE: 9-25-84 MISC. INFO: _____

SPECIFICATIONS:

POWER SUPPLY: D.C. EXCITATION OF 5 VOLTS \pm 1 VOLT.

CAUTION: DO NOT EXCEED 6 VOLTS.

NOMINAL BRIDGE RESISTANCE: 500 OHMS

SAFE STORAGE TEMPERATURE: -65 TO +300F (-54 TO 149C)

OPERATING TEMPERATURE: -40 TO +200F (-40 TO 93C)

NOTE: DURING IMPACT CONTACT TIMES ARE NORMALLY SUFFICIENTLY SMALL TO
AVOID ADVERSE COOLING OR HEATING OF THE STRAIN GAGES.

COMPATIBLE WITH DYNATUP DYNAMIC RESPONSE SYSTEMS, MODELS: 300, 371, 380,
500, AND 600 SERIES.

OPERATING CHARACTERISTICS:

BRIDGE RESISTANCE 954 OHMS

MAXIMUM SAFE LOAD 325,000 LB. (N)

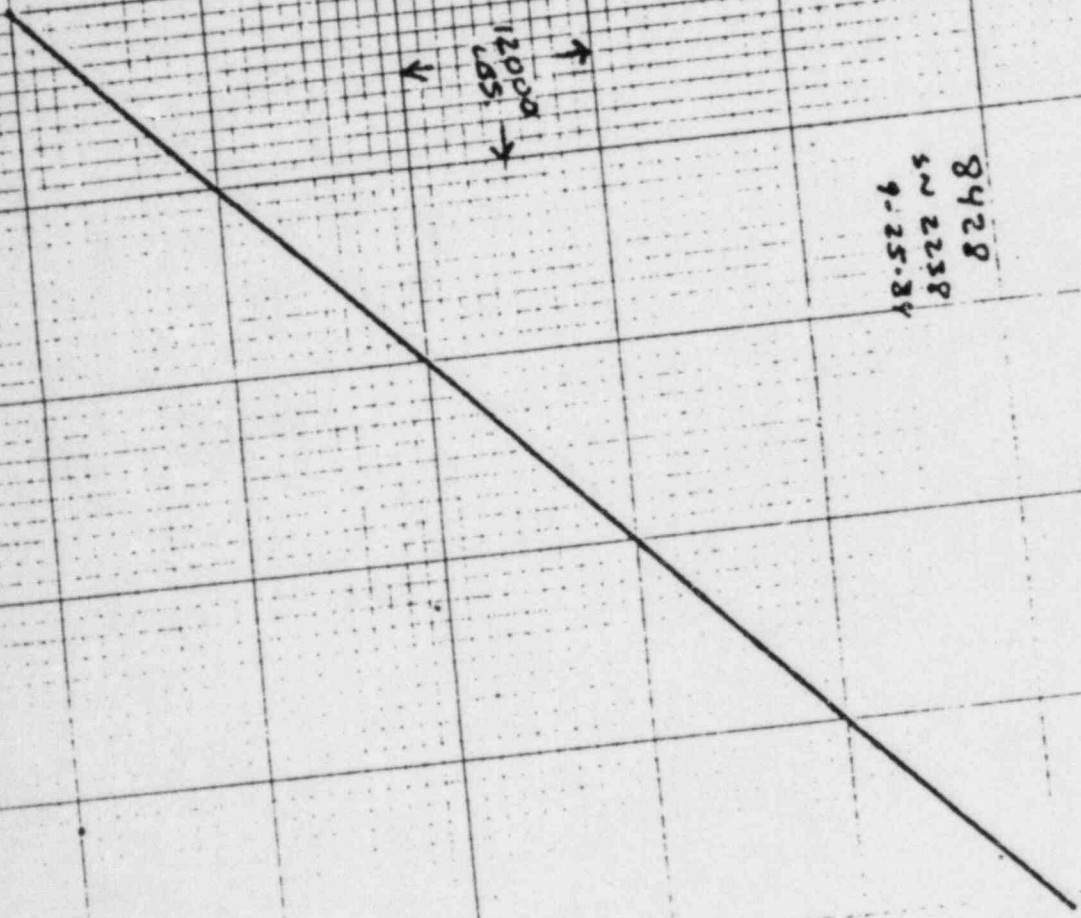
COMBINED LINEARITY, REPEATABILITY AND HYSTERESIS WITHIN 3% FOR RECOMMENDED
LOAD RANGE(S).

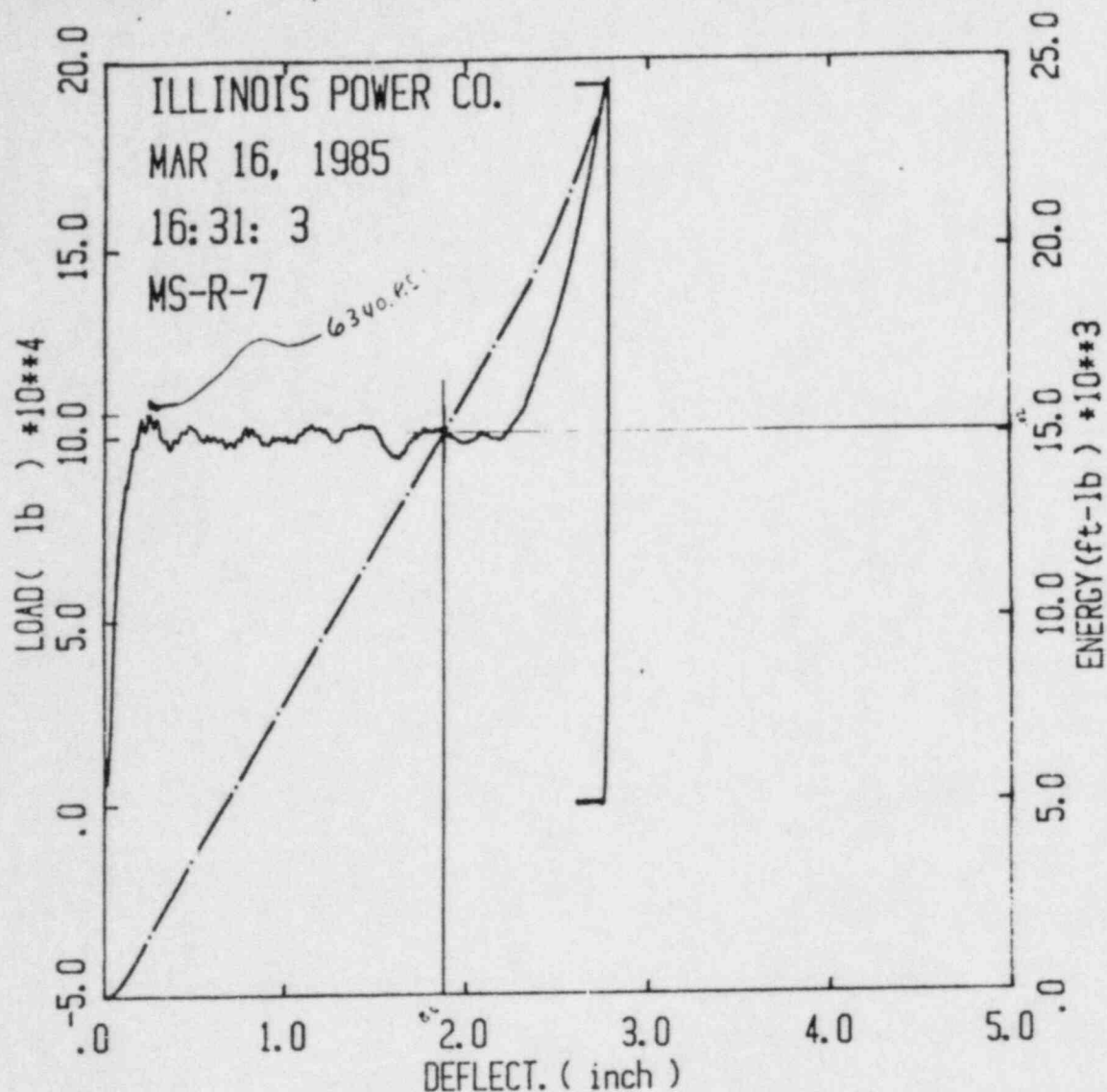
<u>TUP SENSITIVITY (300, 380, 600, 700 Series)</u>	<u>RECOMMENDED LOAD RANGE</u>	<u>CONTACT THICKNESS</u>
249,600 Lbs	0 - 325,000 Lbs.	5/8 In.
<u>CAL DEFLECTION** (371, 500)</u>		
274,560 Lbs.	0 - 325,000 Lbs.	5/8 In.

**EFFECTIVE BRIDGE OUTPUT FOR SHUNT CHANGE OF 3010 OHMS AS DETERMINED BY DYNATUP
DYNAMIC RESPONSE MODULE.**

8428
SM 2238
9-25-84

12000
105
↓





Specimen Id	Temp (f)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
				Max Ld	Total	Max
MS-R-7	160.00	15.3922984	65	25.35	29.30194867	90*****

Filter No. = 1, No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.08 IN. W=4.10 IN. H=3.74 IN.

STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.88 IN.

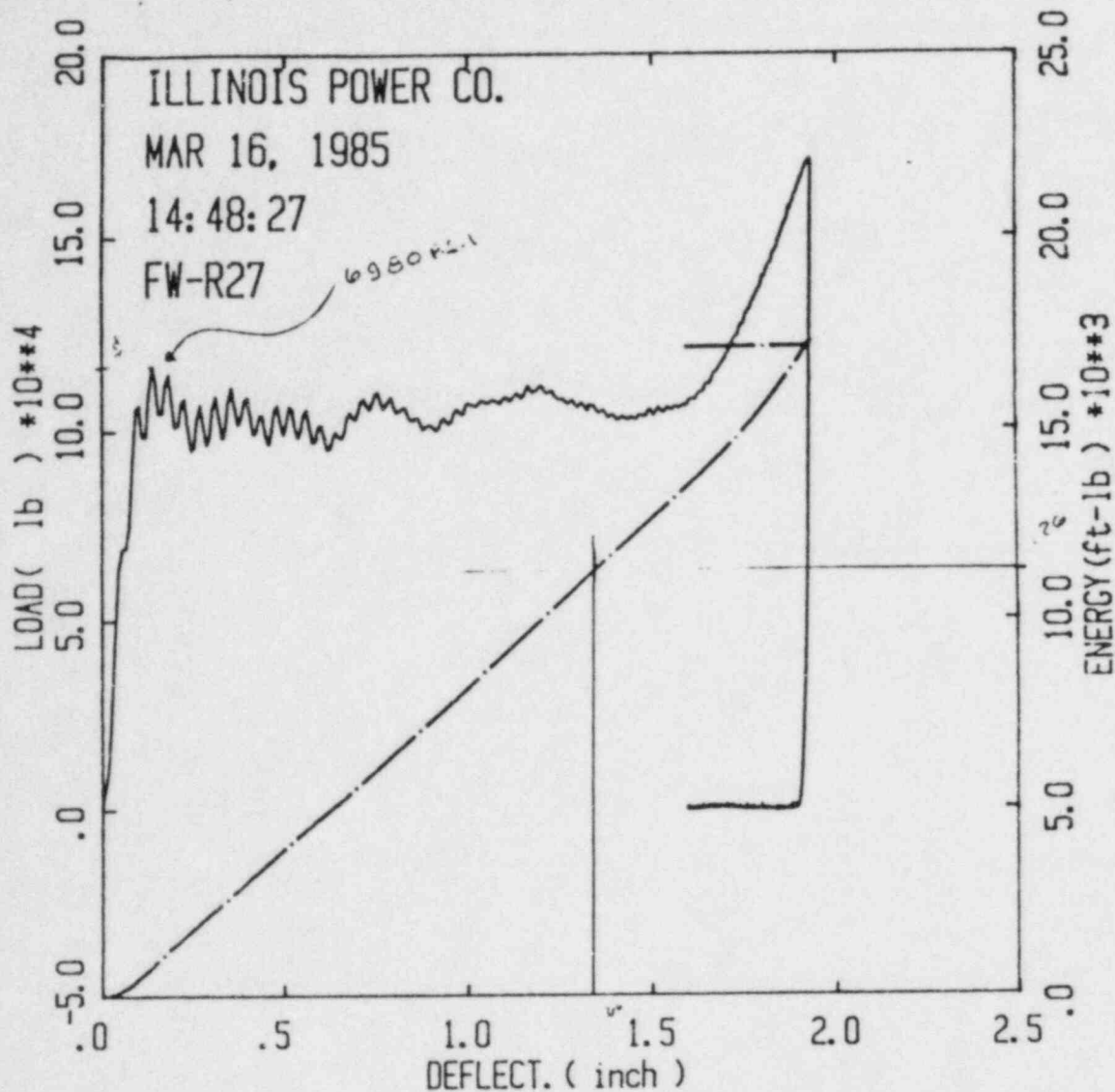
ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 101432 IN-LBS.

A.D.C.S. 5770 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY A. Villa Q.A. REVIEW AND ACCEPTANCE

M-1
38

Top S/N 2238



Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
					Max	MaxId
FW-R27	160.00	15.40	16519.24	18.00	22.00	171139.40

Filter No. = 1, No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.07 IN. W=4.09 IN. H= 2.81 IN.

STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.34 IN.

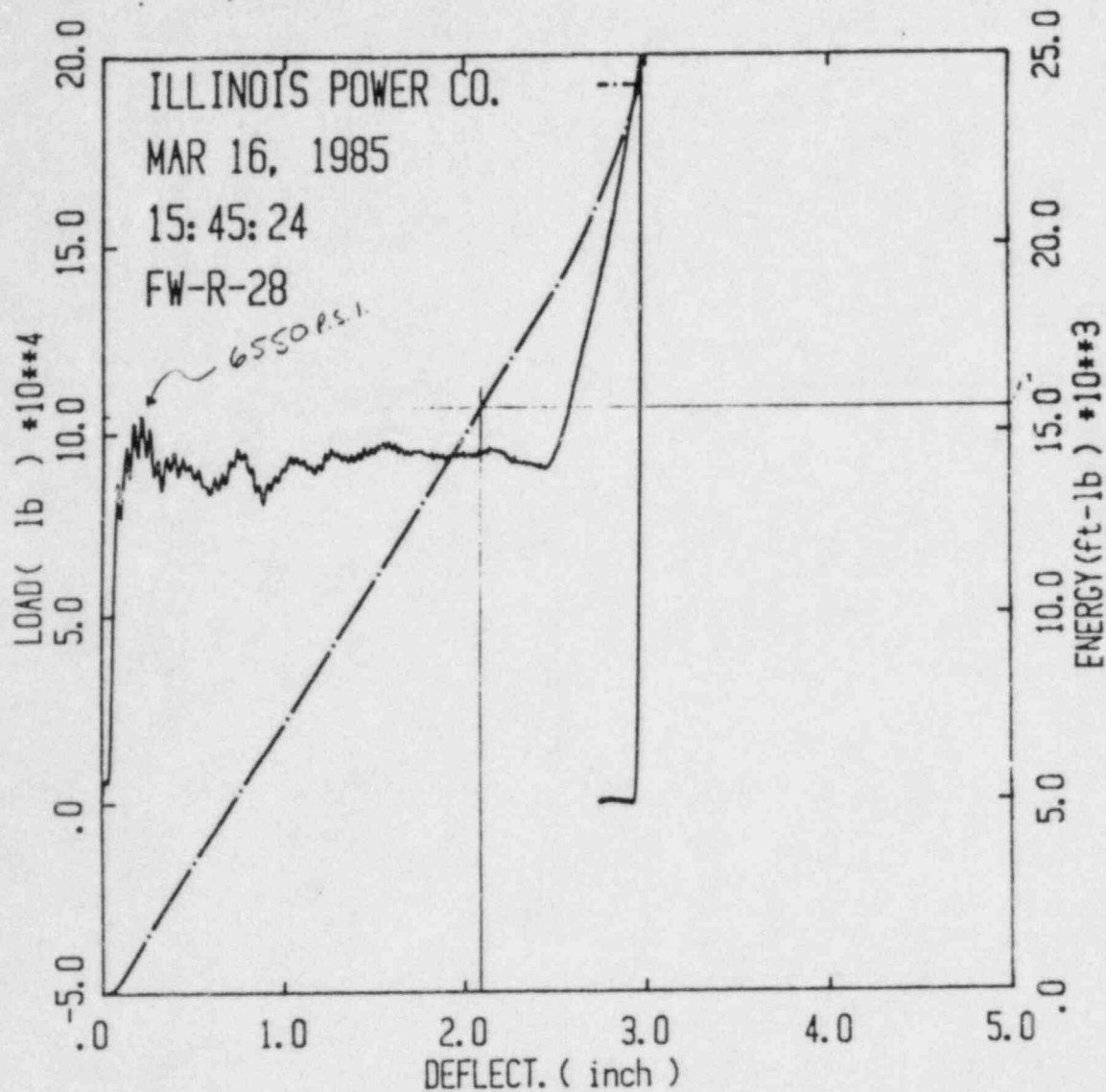
ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 135651 IN-LBS.

A.D.C.S. 6080 P.S.I. HAMMER WEIGHT 4482.5 LBS.

TESTED BY Q. Villa Q.A. REVIEW AND ACCEPTANCE

Tup S/N 2238





Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
				Max Ld	Total	Max Maxld Total
FW-R-28	160.00	15.352	2865.33	26.95	31.351994	14.70*****

Filter No. = 1, No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.00 IN. W=4.01 IN. H=4.04 IN.

STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 2.09 IN.

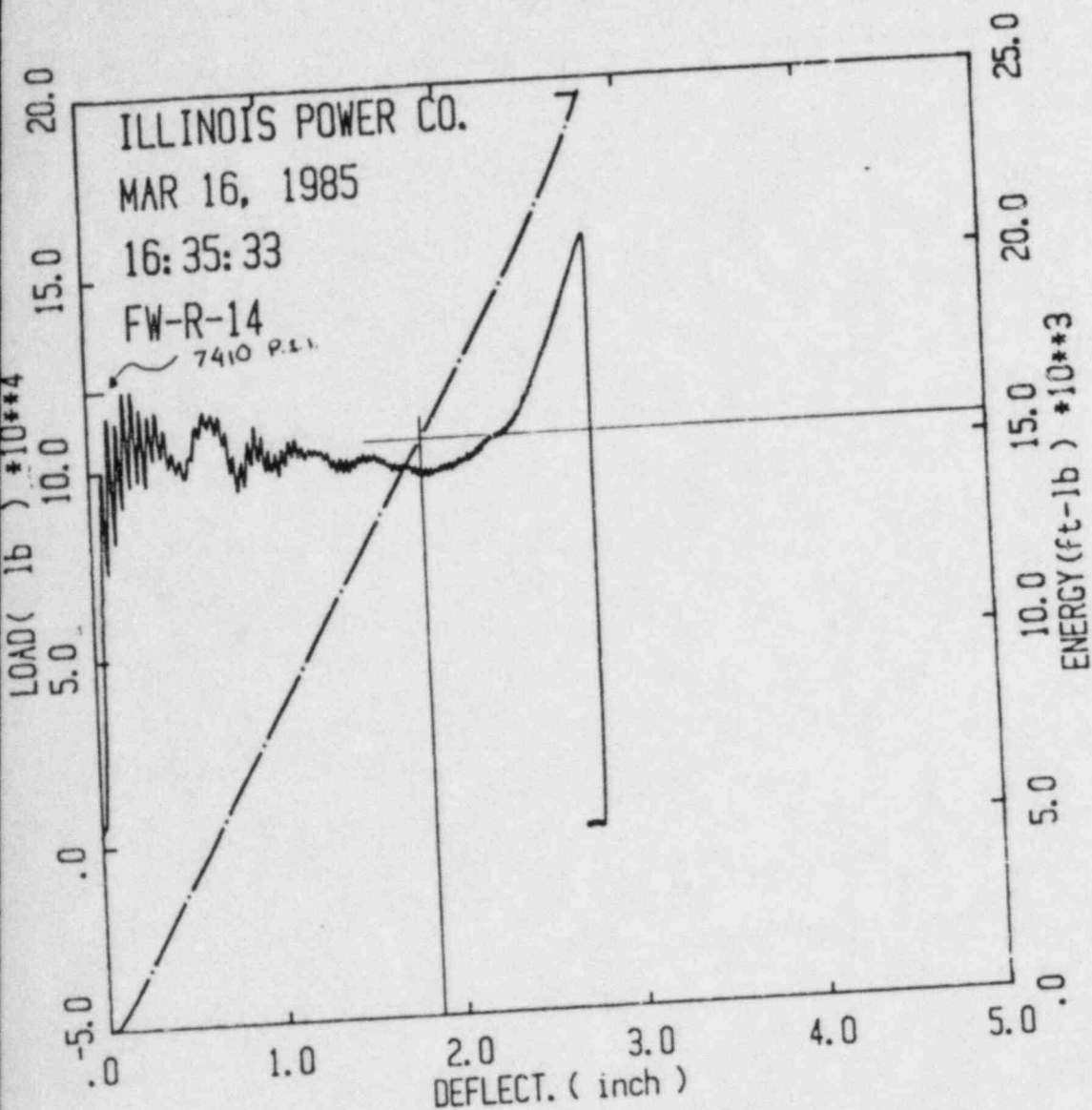
ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 18792.5 IN-LBS.

A.D.C.S. 5610 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY A. Villy Q.A. REVIEW AND ACCEPTANCE

WCI
38

Top S/N 2238



Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
					Max Ld	Total
FW-R-14	160.00	15.43	23104.29	25.55	31.30	156550.70

Filter No. = 1. No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.06 IN. W=4.03 IN. H=3.92 IN.

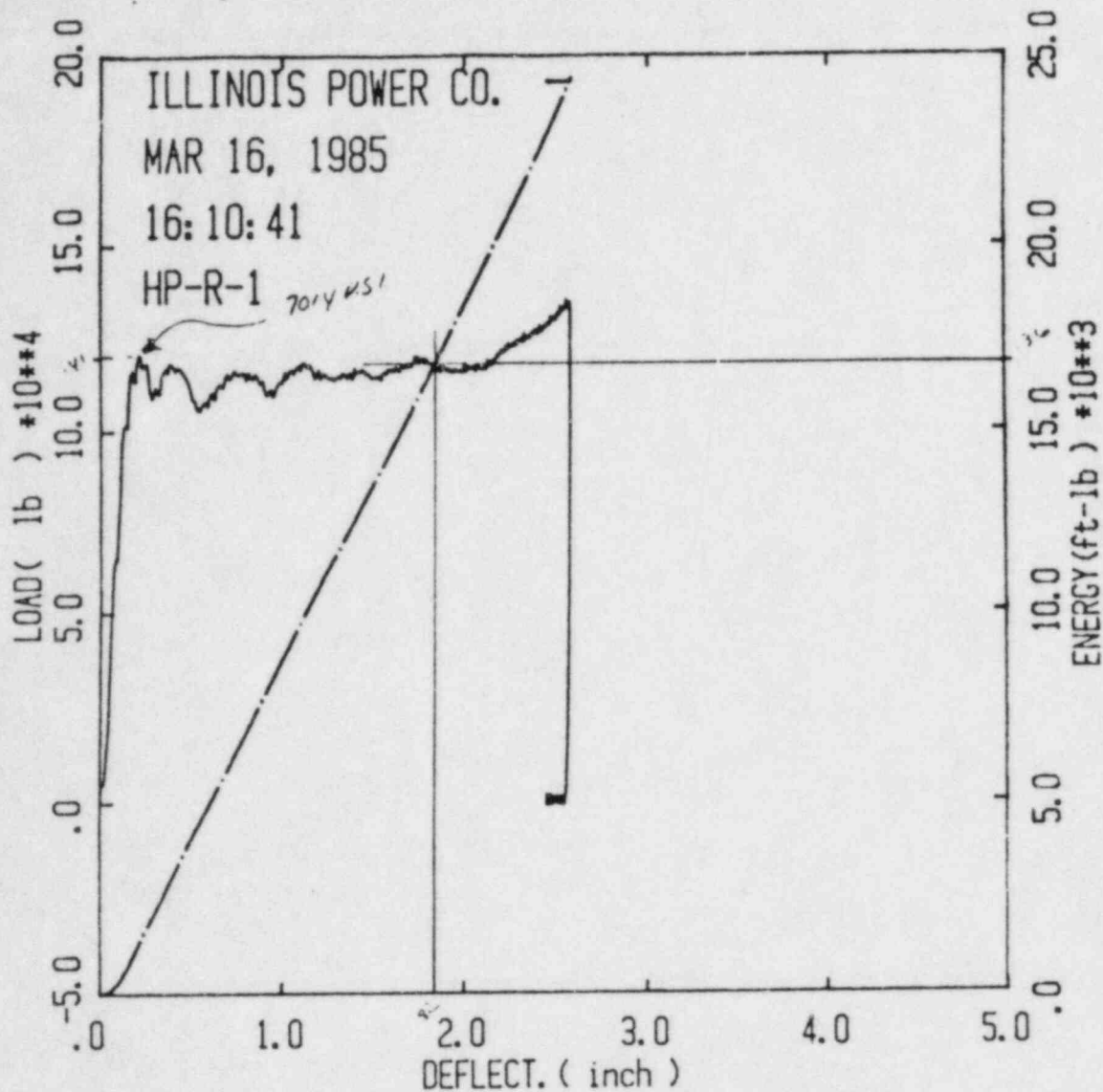
STRAIN @ 2.9 IN-KIPS/IN³ ENERGY ABSORPTION 1.86 IN.

ENERGY @ 2.9 IN-KIPS/IN³ ENERGY ABSORPTION 186000 IN-LBS.

A.D.C.S. 6110 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY G. Villy Q.A. REVIEW AND ACCEPTANCE W.I. 38

Top S/N 2238



Specimen Id	Temp (F)	Veloc. (Ft/sec)	Energy (Ft-lb)	Time (msec)	Load (lb)	Energy (Ft-lb)
					Max Ld	Total
HP-R-1	160.00	15.41	23044.43	24.00	30.65	135344.20*****

Filter No. = 1. No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.27 IN. V=4.03 IN. H=4.05 IN.

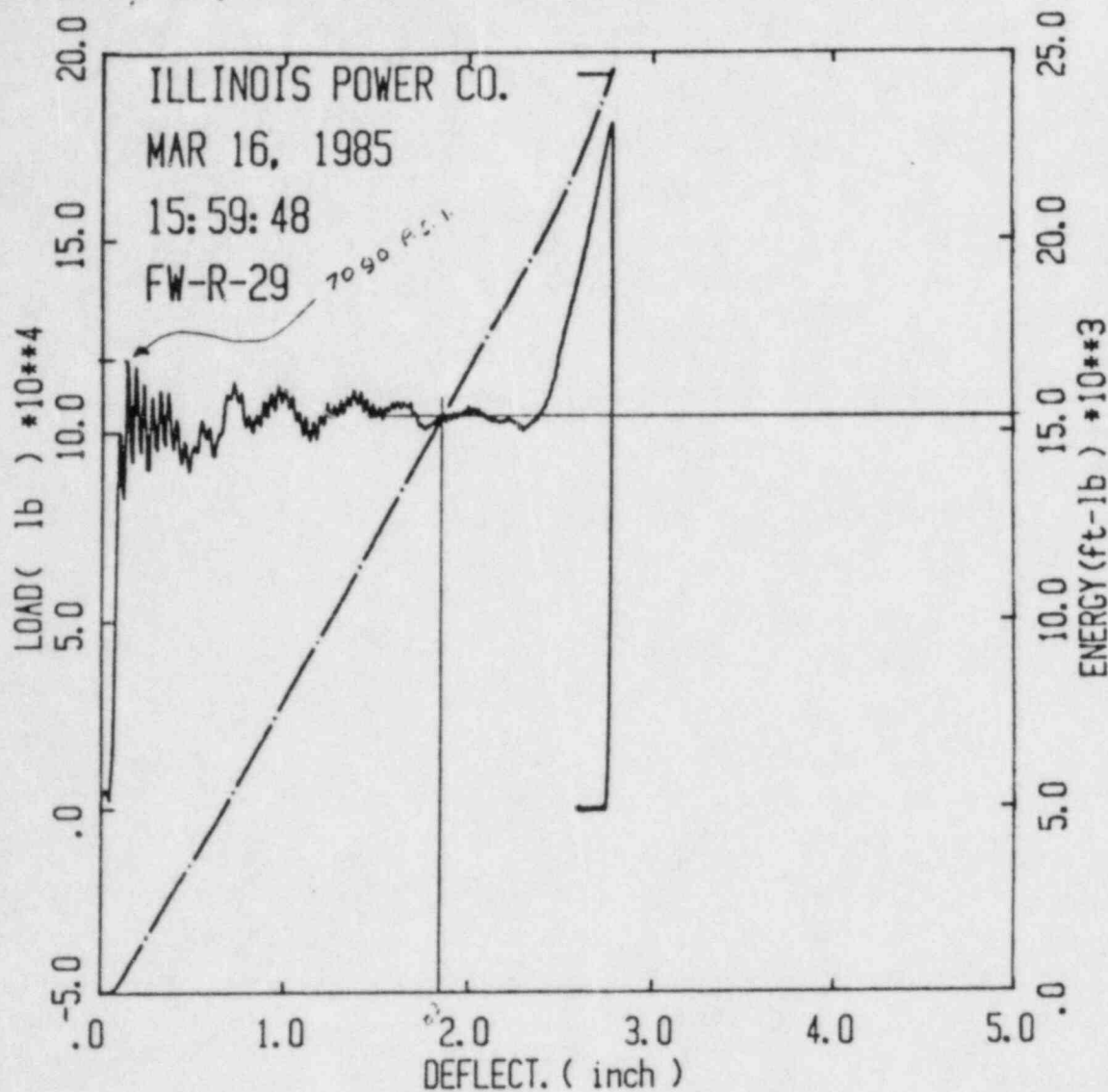
STRAIN # 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.84 IN.

ENERGY # 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 202109 IN-LBS.

A.D.C.S. 6380 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY A. V. J. Q.A. REVIEW AND ACCEPTANCE (38)

Top S/N 2238



Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
				Max Ld	Total	Max Maxld Total
FW-R-29	160.00	15.422	3074.35	25.50	30.35180796	30*****

Filter No. = 1, No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.15 IN. W=4.05 IN. H=3.79 IN.

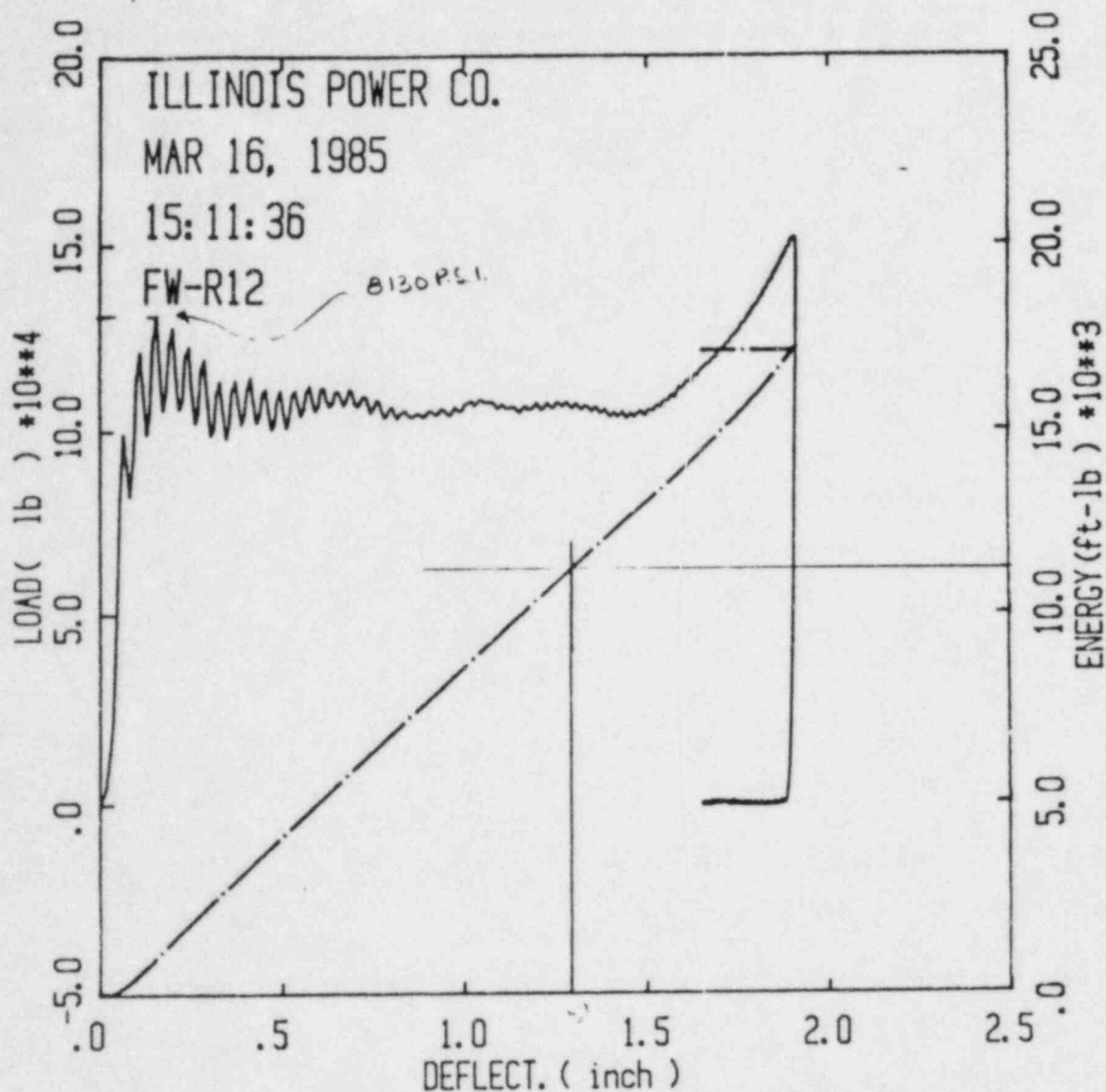
STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.85 IN.

ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 184731 IN-LBS.

A.D.C.S. 5940 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY A. Villy Q.A. REVIEW AND ACCEPTANCE

Top S/N 2238



Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
				Max Ld	Total	Max MaxLd Total
FW-R12	460.00	15.41	16540.70	18.40	22.25	151968.00*****

Filter No. = 1, No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.07 IN. W=3.97 IN. H=2.86 IN.

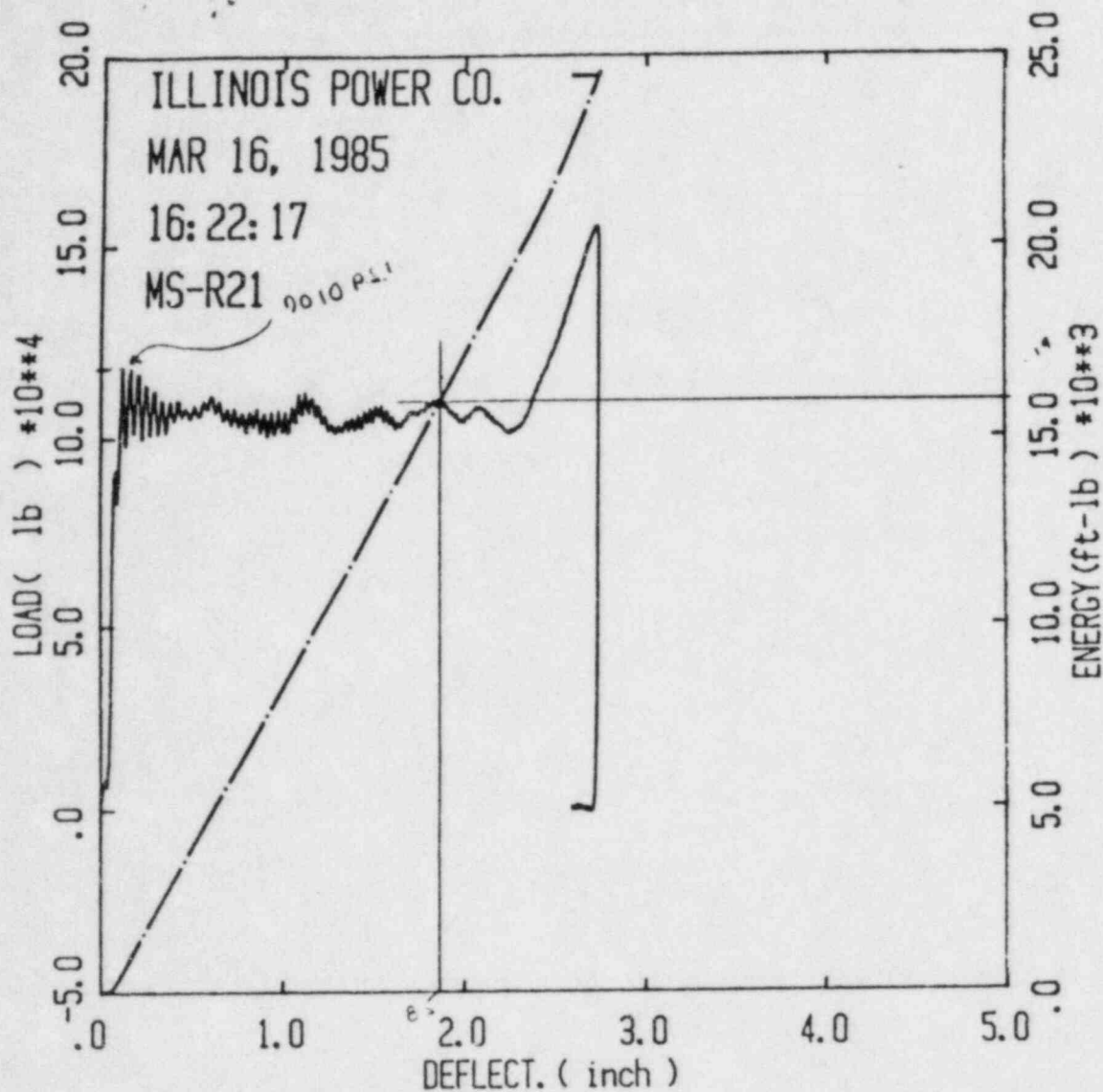
STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.29 IN.

ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 134014 IN-LBS.

A.D.C.S. 6430 P.S.I. HAMMER WEIGHT 4482.5 LBS.

TESTED BY A. V. J. Q.A. REVIEW AND ACCEPTANCE

Tup S/N 2238



Specimen Id	Temp (F)	Veloc. (ft/sec)	Energy (ft-lb)	Time (msec)	Load (lb)	Energy (ft-lb)
				Max Ld	Total	Max
MS-R21	160.00	15.43	23104.29	25.70	31.15	155042.80*****

Filter No. = 1. No Smoothing.

Comments:

SPECIMEN DIMENSIONS L=4.13 IN. W=4.08 IN. H=3.92 IN.

STRAIN @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 1.87 IN.

ENERGY @ 2.9 IN-KIPS/IN3 ENERGY ABSORPTION 191555 IN-LBS.

A.D.C.S. 6080 P.S.I. HAMMER WEIGHT 6245 LBS.

TESTED BY A. Villy

Q. A. REVIEW AND ACCEPTANCE

(38) 3

Top S/N 2238